

# City Of Lowell Firetide/Genetec Infrastructure Upgrade

The City of Lowell is looking to expand its wireless infrastructure and increase the number of the Mobile Video Platforms used for public safety surveillance. The system must interoperate with the existing Firetide Mesh System and allow for existing Firetide 7020's to connect to the wireless network over wireless band and participate in the Firetide Mesh network currently in use in the City. The Bid is to include installation of Six Base Stations at four locations and Nine Mobile Video Platforms (MVP). The Integrator of this solution must be authorized to work with Genetec and Firetide Equipment.

## **Wireless base Station locations & Installation standards**

- A. Site one 375 Merrimack St City Hall Clock Tower (three separate areas)
- B. Site two 10 June St. Robinson School
- C. Site three 45 Branch St Engine 2 Firehouse
- D. Site four 795 Gorham St Engine 1 Firehouse
- E. Each Base station installation must meet the following standards:
- F. Must be compliant with FCC rules and regulations found in CFR 47, Parts 0 to 19. All electrical equipment & antenna assemblies must comply with NEC bonding and grounding requirements
- G. Must be compliant with Category 6 UTP standards & terminate to a T568B pin jack with a IP66 rating.
- H. Must not violate the integrity of the roof and must be setup using corrosion protected non penetrating roof mounts with a protective mat (City Hall Tower is the only exception).
- I. Any and all penetrations needed must be approved and conducted by the city.
- J. Must have network cabling run to the cities current network access device as determined by the City, all cables must be labeled to denote use and verbiage as determined by the City
- K. All electronic devices must have adequate protection from the elements and have proper electrical grounding.
- L. The City Hall Clock Tower location must use the existing inside stone wall as a mounting point for the three Radios and use the existing horizontal metal pipes for the antenna mast. Exact locations of the radios and antennas will be determined by the city.
- M. The City hall clock tower antennas must all be painted black with a paint that does not interfere with the Antennas performance.

## Base station General Requirements

- a. The wireless infrastructure with AutoMesh technology must provide the LPD with the bandwidth needed to expand the reach of their existing network and integrate into the existing Firetide AutoMesh system.
- b. The wireless infrastructure must also provide the LPD with the bandwidth necessary to facilitate a continuous stream of video and data from remote public safety operations throughout the city.
- c. The mesh infrastructure must have the capability to accommodate a variety of fixed and mobile public safety operations throughout the city.
- d. The mesh infrastructure must have the ability to be segmented or combined in order to accommodate needs for greater bandwidth or coverage of all public safety operation locations.
- e. The mesh infrastructure must interoperate with the cities wired & wireless network infrastructure.
- f. The mesh infrastructure must be expandable and adaptable to provide for future integrations. This may include but is not limited to; traffic management, Wi-Fi access for mobile city employees, future or current Site interconnections and wireless broadband for underserved areas.
- g. The wireless mesh nodes shall have both indoor and outdoor models available from the manufacturer
- h. The wireless mesh nodes shall comply with all Ethernet transport standards
- i. The wireless mesh nodes must support 802.11a/b/g/n and be dual radio enabled
- j. All license fees associated with the configuration or operation of wireless devices must be included
- k. The wireless mesh nodes must have the capability of enabling enhanced functionality through software licenses.
- l. Enhanced functionality shall include 802.11n MIMO (multiple input, multiple output) and achieve throughput of up to 300 Mbps outdoors and 400 Mbps indoors or greater.
- m. The wireless mesh nodes must be field upgradable and not need to return to the manufacturer.
- n. The wireless mesh nodes must have the ability to logically combine or “bond” two or more radios to operate as a single unit that would exponentially increase the bandwidth of a single radio equivalent.
- o. The wireless mesh nodes must have integrated spectrum analysis, network capacity planning and antenna alignment tools for network management
- p. The wireless mesh nodes must utilize flow based routing protocol and support advanced load balancing and congestion control mechanisms for optimal routing within the mesh network
- q. Wireless mesh infrastructure must have VLAN capabilities for deploying a multi-service network
- r. The wireless mesh nodes must support connectivity across multiple locations
- s. Mesh infrastructure must provide reliable multicast capabilities
- t. The wireless mesh nodes must have dual configurable radios in the 2.4, 4.9 (U.S. public safety licensed band) and 5 GHz frequency ranges

- u. The wireless mesh nodes must utilize channel widths of 5, 10, 20 and 40 MHz (MIMO only), with 5 and 10 MHz channel widths only available on the 4.9 GHz band
- v. The wireless mesh nodes shall provide ability to eliminate weak radio links in the network
- w. The wireless mesh nodes shall support dynamic frequency channel selection for optimal RF performance.
- x. The wireless mesh nodes shall support transmit power control (TPC)
- y. The wireless mesh nodes shall provide the ability to recover neighbor radio nodes in different bands and frequencies
- z. The wireless mesh nodes shall provide a mix of radio and Ethernet interfaces over the routing domain
- aa. The wireless mesh nodes shall provide the ability to bridge multiple wireless networks using Ethernet
- bb. The wireless mesh nodes shall be modular and may or may not share radios with access point functionality.
- cc. The wireless mesh nodes shall support user defined & prioritized static routes to allow uni-directional flow between source node and destination node with zero or more intermediate nodes
- dd. Each static route on the Source Node can be assigned the following client traffic entering the Source Node and exiting at a destination node: All client traffic, All client traffic entering an Ethernet port or all client traffic with a particular VLAN
- ee. Static routes can be selected between any two source and destination nodes having max 10 hops between them
- ff. Static route should fall back to a dynamic route if the static route is down because of a down link

## **2. Base Station Traffic Prioritization**

- a. The wireless mesh nodes shall have simultaneous support for video, voice and data multi services
- b. The wireless mesh nodes shall support port based QoS and 802.1p standards based QoS
- c. The wireless mesh nodes shall support VLANs and VLAN trunking
- d. The wireless mesh nodes shall provide load balancing on alternate routing paths between source and destination MAC addresses
- e. The wireless mesh nodes shall provide congestion control within the network

## **3. Base Station Wireless Interface**

- a. IEEE 802.11a/b/g/h/n ad hoc; 3X3 MIMO with 2 streams\* ( Purchase of software license required for 802.11n MIMO functionality)
- b. 3X3 MIMO with 2 streams or more
- c. Transmit power up to 400 mW or allowed legal limit per stream
- d. Frequency ranges 2.412 - 2.483 GHz 4.94 - 4.99 GHz (US public safety band) 5.15 - 5.25 GHz (Indoor use only) 5.25 - 5.35 GHz 5.470 - 5.725 GHz 5.725 - 5.850 GHz

- e. Receive sensitivity (typical) 2.4 GHz, DSSS 1 Mbps: -95 dBm 11 Mbps: -88 dBm 2.4 GHz, OFDM 6 Mbps: -90 dBm 54 Mbps: -73 dBm 5 GHz, OFDM 6 Mbps: -90 dBm, 54 Mbps: -73 dBm or better.
- f. Ability to configure variable channel bandwidth
- g. Dynamic Frequency Selection (DFS)
- h. Transmit Power Control (TPC)

#### **4. Base Station Network Ports**

- a. Three or more 10/100/1000 Mbps Ethernet ports with LEDs
- b. IEEE 802.3, 802.3u compliant
- c. CSMA/CD 10/100 autosense

#### **5. Base Station Throughput Requirements**

- a. The wireless mesh nodes shall support up to 70 Mbps throughput in a bonded mode of operation with allowance for throughput degradation
- b. The wireless mesh nodes shall support up to 35 Mbps sustained throughput anywhere in the crime analysis heat map across multiple hops with minimal antenna manipulation.
- c. The wireless mesh nodes shall support low latency of the order of 1.5ms per hop on an average and maximum of 2ms per hop

#### **6. Mesh Management Software**

- a. All wireless mesh nodes shall have management interfaces intergraded into HotView Pro network management software that must be licensed and included with installation. Said software must have all of licenses necessary for all of the nodes to connect concurrently.
- b. The management architecture shall be a client-server architecture with multiple clients logging into a server that will be included with installation. Said server must meet the min requirements of the hotview pro software and be 1u rack mountable.
- c. The management software shall provide statistics and alarms and events on a per radio basis
- d. The node hardware shall provide system status LEDs for power, mesh, faults
- e. The wireless mesh nodes shall support remote software upgrade ability
- f. The wireless mesh nodes shall support telnet & SSH access
- g. The management system will provide single integrated management for both wireless mesh nodes and access points

#### **7. Base Station Security Requirements**

- a. The wireless mesh nodes shall support user name and password security for all Ethernet and serial interfaces
- b. The wireless mesh nodes shall support hardware based encryption

- c. The wireless mesh nodes shall have the capability to distinguish between radios that are part of their network from radios that are not
- d. The wireless mesh nodes shall support manufacturing based digital certificates on each node that authenticates with the network
- e. The digital certificate mechanism shall have the ability to have user defined / signed certificates
- f. The wireless mesh nodes shall have digitally signed firmware files
- g. The wireless mesh nodes shall have the ability to lockout malicious users as they try to access the network
- h. The wireless mesh nodes must provide advanced security, including 802.11i support, dual-layer of FIPS140-2
- i. The wireless mesh nodes shall support 40 bit, 104 bit WEP keys, 128 bit, certifiable 256 bit AES keys (WPA2, end-to-end data) encryption keys
- j. The wireless mesh nodes shall support ESSID encryption
- k. MAC based access control lists and VLAN based access control lists
- l. The wireless mesh nodes shall support MAC address filtering
- m. The hardware shall provide for physical security via a lockable mounting bracket

#### **8. Base Station Scalability Requirements**

- a. The wireless mesh node shall support mesh networks of up to 1000 nodes or more
- b. The wireless mesh networks shall provide the ability to have Ethernet interfaces as part of the routing domain to make use of the wire where/if it is available
- c. The wireless mesh nodes shall provide the ability to connect multiple wireless mesh networks using Ethernet bridging
- d. The wireless mesh nodes shall support multiple gateway interconnects for large networks and increased throughput

#### **9. Base Station Mobility Requirements**

- a. The wireless mesh nodes shall have the ability to support mesh node mobility at high speeds with low handoff times between roaming nodes
- b. The wireless mesh node networks shall have the ability to support 802.11 client mobility across multiple Layer 3 domains

#### **10. Base Station Wireless Mesh Nodes must have the following Certifications**

- a. RoHS (Restriction of Hazardous Substances)
- b. WEEE (Waste Electrical and Electronic Equipment)

#### **11. Base Station Warranty**

- a. All products and services must be warrantied for one year after final acceptance.

#### **12. Base Station Enclosure**

- a. System LEDs (power, status, mesh)
- b. Two Weatherproof power connectors AC & DC
- c. Six Type-N female antenna, Three Ethernet (RJ-45)
- d. Cast aluminum NEMA-4XIP66

### **13. Base Station Power**

- a. DC Input: 12 VDC  $\pm$ 10% (1.8 A Typical, Max 2.8 A)
- b. AC Input: 100-240 VAC, 50-60 Hz, 0.9 A

### **14. Base Station Physical and Environmental Requirements**

- a. The wireless mesh nodes enclosure shall be rugged NEMA 4X/IP67 rated for outdoor deployments
- b. The wireless mesh nodes shall support surge suppression protection
- c. The outdoor mesh nodes shall have weather proof antenna connectors
- d. The outdoor devices shall be pole and/or wall mountable (with low profile mounting)
- e. The outdoor mesh nodes shall provide an optional sunshield for environmental protection
- f. The wireless mesh nodes shall be ROHS & WEEE compliant
- g. The outdoor units shall have the following environmental specifications
- h. Operating temperature: -40°C to +60°C
- i. Storage temperature: -40°C to +85°C
- j. Humidity (non-condensing) - 10% to 90%
- k. Storage humidity (non-condensing) - 5% to 95%
- l. Maximum altitude 15,000 feet (4600 meters)
- m. All roof top installations must use corrosion protected non penetrating roof mounts with a protective Mat
- n. Wind load requirements for the entire structure should be at least 120mph.
- o. Compliant with FCC rules and regulations found in CFR 47, Parts 0 to 19. All electrical equipment & antenna assemblies must comply with NEC bonding and grounding requirements.

### **16. Base Station Antennas**

- a. Antennas must be Broad band 4.9-6.1GHz Triple Polarized Panel type Antennas, for supporting Multiple-Input-Multiple-Output (MIMO) and provide three cable N-Type female, all with identical frequency coverage
- b. Antenna elements must be housed within the same radome.
- c. Each element must be fed by a different cable and each cable will cover the entire 4.9-6.0 GHz spectrum
- d. Frequency; SMD-W 4.9-6.0 GHz
- e. Gain; 14 dBi (peak) or higher
- f. VSWR; 2:1 max over range
- g. Isolation; >20 dB or better between elements
- h. Azimuth Beam width; 90 degrees
- i. Elevation Beam width; 5-10 degrees

- j. Impedance; 50 Ohms (nominal)
- k. Max power; 10 watts or more
- l. Polarization; 45 degrees and vertical
- m. Cable assemblies; Time Microwave LMR-400 Ultra Flex or equivalent Low Loss 400 UltraFlex under 6ft w/ proper factory installed termination.
- n. Case Material; UV resistant ASA
- o. Color; Black
- p. Mounting; Thru-hole, 5/8" wide threaded stud
- q. Mounting Surface; Up to 1/4" (64 mm) thick metal
- r. Operating Temp; -40 to +85° C
- s. Water Ingress; IPx7
- t. Shock and Vibration; EN 61373, IEEE-1478, MIL-810G, TIA-329.2-C

## **17. Mobile Video Platform (M.V.P) \* Fully Assembled**

- a. Must use corrosion protected non penetrating roof mounts with a protective Mat & be easy to assemble/disassemble.
- b. Does not violate the integrity of the roof
- c. Single 120 vac power input from extension cord
- d. NEMA enclosure to provide power & networking connection to IP PTZ camera & firetide 7020 radio.
- e. Rated to handle equipment load and wind ratings 120mph or better.
- f. Compliant with FCC rules and regulations found in CFR 47, Parts 0 to 19. All electrical equipment & antenna assemblies must comply with NEC bonding and grounding requirements.
- g. Cat 6 shielded cabling between Ethernet devices
- h. RF cable assemblies; Time Microwave LMR-400 Ultra Flex or equivalent Low Loss 400 UltraFlex under 6ft w/ proper factory installed termination.
- i. AXIS P5534-E PTZ Camera
- j. Firetide 7020 Radio Antenna Antenna AP20-050-MIMO-19 20 degrees patch antenna 3x3 MIMO, 4.9ghz - 6.1ghz capable
- k. Use a 360 degree positioning parapet mount constructed of aluminum with a powder coat finish. These mounts must be attached to a frame of similar construction and finish.
- l. All MVPs must have the ability to be rapidly deployed, recalled, re-deployed, positioned (including antennas) and configured. The procedure(s) should allow public safety person(s) to respond in a timely manner to the changing crime analysis report. This important mobility requirement for a rapid response application must be met or the MVP system being proposed will not be considered.
- m. All products and services must be warranted for one year after final acceptance.

## **18. Genetec Omnicast Enterprise Video Management Software, Camera and User License(s)**

The city of Lowell public safety video system operates on a Genetec Omnicast Enterprise Video management system, the integrator must be a certified Genetec dealer authorized to sell and service Genetec Systems.

- a. Genetec camera / client licenses P/n # OM-E-1C for 9 camera system
- b. 2-year System Service and Maintenance Agreement
- c. 2-year Omnicast Enterprise Camera Service and Maintenance